



George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

ED23-OWI-001
7/26/01
REVISION B

ORGANIZATIONAL WORK INSTRUCTION

STRUCTURAL DESIGN GROUP ED23

STRUCTURAL DESIGN

APPROVING
AUTHORITY:

| <u>NAME</u> | <u>TITLE</u> | <u>ORG</u> | <u>DATE</u> |
|-------------|--------------|------------|----------------|
| Sid Rowe | Group Leader | ED23 | July, 26, 2001 |

CHECK THE MASTERLIST,
<http://masterlist.msfc.nasa.gov/ed/>
VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE

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DOCUMENT HISTORY LOG

| Status (Baseline/ Revision/ Canceled) | Document Revision | Effective Date | Instructions |
|--|----------------------|-------------------|---|
| Revision | Baseline | 7/28/99 | <p>1. Revision made to reflect new organizational codes due to recent reorganization. ED51 to ED23, ED01 to ED20 for example. Also to reflect QMS Documents to Directives Numbering systems.</p> <p>2. Re-format the Work Flow Diagram to a "portrait" orientation and remove old organizational references - the content of the flow diagram was not changed. In section 8.1.0.1 changed review period from 3 years to every year by July 1st.</p> <p>3. Section 8.4 first sentence relative to a quality records storage cabinet in rm 4026 is deleted, as the storage area does not currently exist.</p> <p>4. Section 4.1 was reworked to aid in transition of Task Agreements to Collaborative Work Commitments (CWC).</p> |
| Revision | A | 8/18/99 | Added a table to section 8.3 Quality Record Retention that adds disposition of our quality records after retention schedule is met. Also changed the list of quality records in section 8.2 to a table, with no changes to the information in the section. |
| Revision | B | 7/26/01 | <p>Changes to Retention Schedule for Quality Records section 8.3 as follows: Group Memorandums retention is 2 years- same disposition and Performance plans retention is 4 years after day of appraisal disposition is remove from file and destroy.</p> <p>Removed from Applicable Documents: ANSI/ASQC Q9001 Quality System Model. Added to Applicable Documents: MSFC-STD-2806 MSFC Tailoring Guide for the Global Requirements Manual, MPG 1440.2 MSFC Records Management Program, ED43-017 MSFC Engineering Drawing Checking. Added reference to Marshall Management Manual in paragraphs 1.1 and 1.2. Added MPD & MPG to Acronym Definitions. Removed (4.3) from paragraph 4.2. Added, "As part of this process our documentation is reviewed by drawing checkers using ED43-017." Under Quality Record Retention: changed Group Memorandums to 2 years, and Performance Plans to 4 years after day of appraisal.</p> |
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1. SCOPE.

1.1 Scope. This Organizational Work Instruction (OWI) defines the methods and procedures used at Marshall Space Flight Center (MSFC) to design structural and experimental space flight hardware that are within the scope of the Marshall Management Manual (MPD 12.80.1).

1.2 Purpose. This OWI establishes the process for design of advanced vehicles, spacecraft, payloads, experiments, pyrotechnic devices for separation/range safety, and design integration of structural, mechanical and propulsion subsystems; including traditional and advanced meteoroid/orbital debris protection systems for space vehicles. It also includes processes for assembly engineering of launch vehicles, experiments, payloads, and other related flight hardware. Implementation of this OWI will ensure that the design meets the design requirements and the Marshall Management Manual, MPD 1280.1, requirements.

1.3 Applicability. This OWI applies to flight design work done at MSFC by Structural Design Group (ED23) personnel and by contractors for ED23.

2. APPLICABLE DOCUMENTS.

| | |
|--------------|--|
| MPD 1280.1 | Marshall Management Manual (MMM) |
| MPG 8060.1 | Flight Systems Design/Development Control |
| MPG 8040.1 | Configuration Management Plan, MSFC Programs/Projects |
| MPG 1410.1 | Document and Data Control for Organizational Issuances |
| MPG 8040.2 | Product Identification |
| MPG 8040.3 | Product Traceability |
| MWI 8040.4 | Application Guidance for Traceability |
| MWI 8730.1 | Equipment Logs/Records |
| MSFC-STD-555 | MSFC Engineering Documentation Standard |

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| MSFC-STD-2806 | MSFC Tailoring Guide for the Global Requirements Manual |
| MSFC-MNL-2348 | Specifications and Standards Approved Baseline List. |
| NPG 1441.1 | NASA Records Retention Schedules |
| MPG 1440.2 | MSFC Records Management Program |
| ED20-OWI-001 | Structures and Dynamics Laboratory Quality Maintenance Processes |
| ED43-017 | MSFC Engineering Drawing Checking |

3. DEFINITIONS.

3.1 Definitions of Terms:

Customer: The recipient of a product or service provided by the Marshall Space Flight Center.

Document Control Custodian (DCC): The individual(s) responsible for maintaining an organization's work instructions.

Master List: A controlled list of those currently approved organizational work instructions.

Master List Custodian (MLC): The individual responsible for maintaining the organization's Master List.

Marshall Management Manual (MMM): The **Level 1 document** that defines the Marshall Space Flight Center's policy and commitment to quality.

Marshall Work Instructions (MWI): **Level 2 documents** that describe how Marshall Space Flight Center will implement each of the elements of ISO-9001. A particular Marshall Standard Procedure defines MSFC's organizational relationships and responsibilities for implementing a particular portion of ISO-9001, describing what's to be done, where it's done, and by whom its done.

New Work Point of Contact (NWPOC): The Structures, Mechanics, and Thermal Department staff position responsible for maintaining a record of ED20 Task Agreements.

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Office of Primary Responsibility (OPR): For any particular document/data, the office of primary responsibility for that document/data is the organization responsible for maintaining the accuracy and currency of that document/data.

Organizational Work Instructions (OWI): Organizational Work Instructions are **Level 4 documents** that provide step-by-step directions to perform specific duties that apply to one or more MSFC organizations, but not to all MSFC organizations.

Quality Records: Documentation furnishing objective evidence of activities performed or results achieved which substantiates that work has been completed in fulfillment of specified customer and/or organizational requirements.

Task Agreements: Work authorization documents between the Department and its customers. May also be referred to as Collaborative Work Commitments (CWC).

3.2 Acronym Definitions:

CWC: Collaborative Work Commitments

DPRS: Documentation Package/Routing Slip

ECR: Engineering Change Request

EO: Engineering Order

EPL: Engineering Parts List

FEO: Floor Engineering Order

FEPL: Floor Engineering Parts List

DCC: Document Control Custodian

MLC: Master List Custodian

MMM: Marshall Management Manual

MPD: Marshall Policy Directive

MPG: Marshall Procedures and Guidelines

MWI: Marshall Work Instruction

NWPOC: New Work Point of Contact

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OPR: Office of Primary Responsibility

OWI: Organizational Work Instruction

4. INSTRUCTION.

4.1 Accepting and Documenting New Work. Acceptance of new work and workflow internal to ED23 group shall be in accordance with ED20-OWI-001.

4.2 Requirements Development. The task agreement identifies ED23's role in developing requirements. See Design Input section of MPG 8060.1.

4.3 Technical Consultation. The task agreement identifies ED23's role of providing technical consultation services to the customer. Consultation can be in the form of supporting cooperative agreements with industry partners, or providing a contracting officer's technical representative for technical contracts.

4.4 Design Development. ED23 will evaluate all design requirements and develop and document conceptual design(s). ED23 in concert with the systems engineer and analysis personnel evaluates and selects or recommends the concept that best meets the design requirements. Design development is performed by following steps 4.2 through 4.11, excluding step 4.3.

4.5 Design Consultation. ED23 consults with other technical experts from vendors, other NASA centers, other civil service agencies, and contractors, as the designer deems necessary to facilitate concept selection. Design consultation is an iterative process; the designer consults with sources until the hardware is fabricated.

4.6 Analysis.

4.6.1 Analysis Consultation. ED23 consults with the different analysis groups, (stress, dynamics, thermal, and materials) as deemed necessary to obtain concurrence on the design per the project plan and MSFC-STD-555. The ED23 designer performs or obtains a meteoroid/orbital debris analysis to assess survivability per project plan requirements. Analysis consultation is an iterative process; the designer continually consults with the assigned analysts until release sign off.

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4.6.2 Analysis Code Evaluation. ED23's analysis codes will be functionally tested on their respective platforms using vendor supplied and/or recommended test cases sufficient to satisfy the user that the code is performing properly. At the discretion of the Group Leader, in-house developed codes may be submitted to other organizations, including other NASA centers, for independent verification.

The engineering drawings developed as a result of sizing structural elements, components and assemblies using information from these analysis codes are submitted to team and group level management for review and approval.

4.7 Support Reviews. ED23 supports the design reviews as called for in the task agreement. Support documentation can include the development of drawings, sketches, design analysis, view graphs, and presentations. Support documentation that is not released through the MSFC Documentation Repository is maintained by the originator as reference documentation. Typical reviews include: Requirements Review, Preliminary Design Review (PDR), Critical Design Review (CDR), Pre-Shipment Review, and Flight Readiness Review (FRR).

4.8 Safety & Mission Assurance (S&MA) Inputs. ED23 obtains S&MA inputs on the design and documentation for eventual release sign-off per MSFC-STD-555.

4.9 Producibility Inputs. ED23 consults the Materials, Processes, and Manufacturing Dept. for a producibility review of preliminary drawings or concepts for producibility related changes/options to be incorporated into the final design per MSFC-STD-555.

4.10 Product I.D. & Traceability.

4.10.1 Product I.D. ED23 establishes and documents product identification methodology per project plan via MPG 8040.2 and MSFC-STD-555. In selecting the identification method ED23 accounts for the following as applicable: part or assembly usage, part location within a vehicle or assembly, part proximity to optics/offgassing, and part proximity/toxicity to crew members.

4.10.2 Product Traceability. ED23 recommends and documents the traceability levels for hardware via notes on the design drawings and EPL's per project plan, MPG 8040.3, and MWI 8040.4.

4.10.3 Log Book. ED23 in concert with the systems engineer will specify on the drawing or procurement spec the requirement

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for an equipment log book (MSFC-Form-3473). The log book should be specified per MWI 8730.1.

4.11 Document Design. ED23 personnel documents the design per MSFC-STD-555 and the project plan. The project plan can "tailor" the design documentation for the scope or size of the project.

4.12 Release. ED23 releases all flight documentation into MSFC's Documentation Repository per MSFC-STD-555 or per "MSFC-STD-555 as tailored" by the project plan. As part of this process our documentation is reviewed by drawing checkers using ED43-017. The drawing release cycle will verify proper use of specifications and the signatures on the drawing will approve the use of those specifications. MSFC-MNL-2348 "Specifications and Standards Approved Baseline List" is a useful document for choosing applicable specifications. ED23 engineers and designers maintain individual files of design calculations and reference material. These data are controlled by each employee. The final analyses performed by supporting disciplines (stress, thermal, materials, etc.) are validated by the approval signatures on the released drawings. In cases where engineering calculations are performed that are not reflected on released drawings, the individual engineer's calculations are validated by the appropriate team lead and/or group lead. The team lead/group lead will assure that proper interfaces with the appropriate disciplines have been performed. In the case of "inscope" design drawings being delivered to the customer without a release cycle that includes a Change Control Board approval, ED23 will deliver the drawings with a memorandum of transmittal to the customer. This applies to "in-house" and contractor design work.

4.13 Support Fabrication/Procurement. ED23 submits fabrication requests to have hardware built and assists civil service and contractor fabricators with issues dealing with ED23 hardware per the project plan. These issues include Basic Ordering Agreements (BOA) procurement, material substitution, vendor information, hardware non-conformance, etc.

4.14 Design Changes as required. ED23 releases necessary documentation per MSFC-STD-555 to facilitate changes as required during the course of the project. Changes to ED23 released documentation are initiated on an ECR and follow the process outlined in MPG 8040.1 unless specifically tailored by the project plan.

4.15 Support Testing/Product Delivery. ED23 provides support during the testing and product delivery phase of the project per the project plan and task agreements.

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4.16 Data Control. During the design phase of a project each designer maintains their CAD, CAE, and other supporting files, and ensures their correctness and proper usage for the intended design. After completion/ termination of the project the ED23 System Manager archives electronic CAD and CAE data generated by ED23. The ED23 System Manager is appointed by the Group Leader. The system manager designates a central location for file storage and determines the storage media. The system manager catalogues the files for retrieval. The archived files shall be kept for a minimum of 10 years after project completion/ termination. The system manager complies with relevant center-wide work instructions on data control and MPG 1410.1.

5. NOTES. None.

6. SAFETY PRECAUTIONS AND WARNING NOTES. N/A

7. APPENDICES, DATA, REPORTS, AND FORMS. None.

8. QUALITY RECORDS.

8.1.0 Organizational Work Instructions (OWI). ED23's format is non-constrained, with the preference being that described in MPG 1410.1.

8.1.0.1 Review of Quality System Documentation. The Group Leader will assign personnel to review all quality system documentation: (i.e., MPGs, MWIs, OWIs, and any other documents/forms *that affect* ED23). These personnel shall alert the OPR of potential changes/consequences to ED23 documentation. These personnel will also review all documentation under ED23's responsibility for continued need, revision, or cancellation. This review will be conducted every year by July 1st and documented by a memo for record.

8.1.1 Numbering System. OWI's shall be numbered using the following method:

| TYPE | DOC | ORG | TEAM (if used) | NUMBER | REVISION |
|-----------|-----|-----|-------------------|--------|----------|
| ED23 | - | OWI | - XXX | XXX | X |
| Exp. ED23 | - | OWI | - 001 | 002 | A |

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Exp. ED23 - OWI - 004 - 013 G

Note: For revisions do not use the following letters: I, O, Q, S, X, or Z.

8.1.2 OWI Change Procedure. When it is necessary to change an ED23 OWI the following procedure will be used:

1. Present the proposed change to the Group Leader or his appointee.
2. The Group Leader presents change to the Group for feedback from the affected users.
3. After considering user feedback the change will be accepted or rejected.
4. If Accepted the change will be incorporated.
5. The OWI will be updated to the next revision per section 8.1.1.
6. The ED23 DCC/MLC will be notified that the OWI has been updated and will then update the Master Document List.
7. When time criticality of information in ED23's electronic documentation warrants, the document OPR will notify the ED23 DCC, which will distribute the document via E-mail to ED23 until the official intranet document comes online.

8.2 Quality Record Types. ED23 Generates the following quality records:

| RECORD TYPE | LOCATION |
|--|-----------------------------|
| Flight Drawings | MSFC Repository |
| Engineering Parts Lists (EPL) | MSFC Repository |
| Engineering Orders (EO) | MSFC Repository |
| Floor Engineering Order (FEO) | MSFC Repository |
| Floor Engineering Parts List (FEPL) | MSFC Repository |
| Master Document List | ED23 ISO Custodian/Intranet |
| Organizational Work Instructions (OWI) | ED23 ISO Custodian/Intranet |
| Group Memorandums | ED23 MSA's |
| Technical Memorandums (TM) | MSFC Technical Library |

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|--|---------------------|
| Engineering Change Request (ECR) Log Book | ED23 Group Leader |
| Documentation Package/Routing Slip (DPRS) Log Book | ED23 Group Leader |
| CAD & CAE Archived Files | ED23 System Manager |
| Performance Plans | ED23 MSA's |

8.3 Quality Record Retention. NPG 1441.1 sets forth the minimum retention schedules for federal records for all NASA installations. NPG 1441.1 takes precedence over any retention schedule conflicts.

Retention Schedule for ED23 Quality Records:

| RECORD | RETENTION | DISPOSITION |
|---------------------------------|---------------------------------------|--|
| Master Document List | Replaced by next revision | N/A (Electronic/Intranet managed) |
| Organizational Work Instruction | Replaced by next revision or canceled | N/A (Electronic/Intranet managed) |
| Group Memorandums | 2 years | Remove from file, make historical record |
| ECR Log Book | 5 years | Remove from file, make historical record |
| DPRS Log Book | 5 years | Remove from file, make historical record |
| CAD & CAE Archived Files | 10 years | Remove from file, make historical record |
| Performance Plans | 4 years after day of appraisal | Remove from file, and destroy |

8.4 Quality Record Storage. ED23 Quality Record Storage for our QMS documents is on the Marshall intranet site. To view or obtain a copy of our current OWI(s) or Masterlist go to the Inside Marshall intranet address:

<http://masterlist.msfc.nasa.gov/ed/>

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This intranet address contains the "official" OWI documents, and Masterlists, ED23 personnel must verify any paper copy to be the latest version before using.

8.5 Document Control & Master List Custodian. The ED23 group leader appoints an ED23 Master List and Document Control Custodian and Alternate to be responsible for storage and maintenance of the groups' master document list.

8.6 Memorandums. The secretary logs the group Memorandums using the Following: **Memorandum Number, Date, To, From, and Subject**. The originating office files the Memorandum and retains it per the retention schedule (8.3). The secretary assigns the Memorandum Number as follows:

Office Symbol (Year- Sequential Number)

EDXX(XX-XXX)

Examples: ED23(99-001)

ED23(00-035)

9. TOOLS, EQUIPMENT, AND MATERIALS. N/A

10. PERSONNEL TRAINING AND CERTIFICATION. The employees requiring certification or specific training will be identified by the Group/Team Lead in a training record or the employee's performance plan that states the function(s) for which they will be certified or trained. The Group/Team Lead will also document in the employees performance plan, evidence of successful completion of required certification and the required recertification interval. If other specific training is required of an employee, the supervisor will identify the training in the employee's performance plan or a training record. In the event there are no functions that require certification within ED23, the Group/Team Lead will not be required to produce a certification training record or statements in the employee's performance plan.

11. FLOW DIAGRAM. The following is a representative work flow diagram.

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